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UNITED STATES DISTRICT COURT
DISTRICT OF OREGON
PORTLAND DIVISION

DON'T SHOOT PORTLAND, et al.)	
)	Case No.
Plaintiffs)	
)	DECLARATION OF DR. SVEN-ERIC JORDT IN
v.)	SUPPORT OF PETITION FOR TEMPORARY
)	RESTRAINING ORDER
CITY OF PORTLAND, a municipal corporation,)	
)	
Defendant.)	
)	
)	
)	
)	

I, Sven-Eric Jordt, declare as follows pursuant to 28 USC § 1746:

1. I am tenured Associate Professor of Anesthesiology, Pharmacology & Cancer Biology at Duke University School of Medicine and faculty in Duke's Integrated Toxicology and Environmental Health Program (ITEHP). My research laboratory discovered fundamental mechanisms through which smoke irritants, chlorine gas, tear gas agents, and industrial chemicals cause pain and lung injury. Based on these discoveries, my group developed treatment interventions for chemical injuries, supported by the Countermeasures Against Chemical Threats (CounterACT) program of the National Institutes of Health. Other projects focus on the role of chemical exposures in environmental allergies (asthma, poison ivy contact dermatitis), the role of the nervous system in lung health and on the toxicity of menthol and other flavor chemicals in tobacco products, including electronic

DECLARATION OF DR. SVEN-ERIC JORDT IN SUPPORT OF
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cigarettes.

For these discoveries I received the Presidential Early Career Award for Scientists and Engineers (PECASE) by the President of the United States, the Outstanding New Environmental Scientist Award (ONES) by the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health, the Early Excellence Award of the American Asthma Foundation and the 2019 Leading Edge in Basic Science Award by the Society of Toxicology (SOT). From 2017-19 I served as Chair of the Terrorism and Inhalation Disaster (TID) Section of the American Thoracic Society (ATS), the professional society of lung doctors and researchers in the United States.

A detailed CV is attached to this declaration.

2. I make this declaration in support of the Plaintiffs' Motion for Temporary Restraining Order.
3. My laboratory studies the mechanism of pain, lung injury and inflammation, with the goal to develop new treatments for these conditions. Beginning in the late 1990s, I contributed to the discovery of receptors for painful chemical irritants in nerves in the human body that signal pain. We found that tear gas agents such as CS (2-(o)-chlorobenzalmalononitrile) and CN (2-chloroacetophenone) are the most potent pain-inducing agents we know activating these receptors. We also demonstrated that CS tear gas agents can trigger lung inflammation in animal studies. Ongoing studies focus on the toxicological effects of tear gas agents, especially in the skin where CS agent can cause burns and blistering.
4. Together with Dr. Erik Svendsen, currently Director of the CDC's,

Division of Environmental Health Science and Practice, I published a landmark review on the effects and toxicity of tear gas agents in 2016, citing and discussing >80 research studies in the field:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5096012/>

I would like to specifically point out studies by the US Military cited in this review, and studies by colleagues of the Turkish Thoracic Society conducted after tear gas deployment in Istanbul, all pointing to adverse effects of tear gas on the lungs. :

- a) O-chlorobenzylidene Malononitrile (CS Riot Control Agent) Associated Acute Respiratory Illnesses in a U.S. Army Basic Combat Training Cohort

<https://academic.oup.com/milmed/article/179/7/793/4259353>

- b) O-chlorobenzylidene Malononitrile (CS Riot Control Agent) Exposure in a U.S. Army Basic Combat Training Cohort

<https://pubmed.ncbi.nlm.nih.gov/25603650/>

- c) Evaluation of CS (O-Chlorobenzylidene Malononitrile) Concentrations During U.S. Army Mask Confidence Training

<https://pubmed.ncbi.nlm.nih.gov/22010329>

- d) Identification of Compounds Formed During Low Temperature Thermal Dispersion of Encapsulated O-Chlorobenzylidene Malononitrile (CS Riot Control Agent)

<https://pubmed.ncbi.nlm.nih.gov/20391049/>

- e) Extensive Exposure to Tear Gases in Ankara

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6453633/>

- f) Long Term Effects of Tear Gases on Respiratory System: Analysis of 93 Cases

<https://www.hindawi.com/journals/tswj/2014/963638/>

- g) Health risks of exposure to CS gas (tear gas): an update for healthcare practitioners in Hong Kong

<https://www.hkmj.org/abstracts/v26n2/151.htm>

- h) Transient Receptor Potential Ankyrin 1 Antagonists Block the Noxious Effects of Toxic Industrial Isocyanates and Tear Gases

<https://pubmed.ncbi.nlm.nih.gov/19036859>

- 5. Our own discoveries in the mid 2000s represented a paradigm shift in the field.

While tear gas was considered a non-specific irritant in the past, we revealed that tear gases specifically target the nervous system to induce pain, representing a category of nerve agent. We also provided a mechanistic explanation for the inflammatory effects of tear gas in the lung, in part mediated by nerve fibers in the lung that trigger cough and bronchoconstriction, such as in asthma. We therefore believe that individuals affected by chronic lung disease, such as asthma or COPD, are especially vulnerable to the effects of tear gas.

Studies by US military epidemiologists cited above revealed that recruits who were routinely exposed to tear gas in training suffered lung injuries, and were more likely to develop respiratory illnesses after the training exposure, following screening for influenza, pneumonia, bronchitis and other conditions, many caused by viruses.

Based on these findings the US military reduced tear gas exposure concentrations during training exercises. The US military also found that the burning of CS tear gas agent can produce long-lived toxic chlorinated chemicals that may pose a threat to the environment and need to be studied further.

Studies by Turkish doctors, cited above, demonstrate that tear gas exposures can cause long lasting lung injuries resulting in chronic bronchitis and other complications. Doctors in Hong Kong (see citation) also warned of widespread skin, eye and respiratory injuries, and complications during treatment and risks for medical personnel treating exposure victims.

In total, more recent research invalidates the assumption that tear gas is safe and has no long term effects.

6. Current footage and reports on tear gas use in Portland and across the United States points to a fundamental strategic change in the use of tear gas and other riot control agents by police. Police departments have procured large arsenals of tear gas in recent years and deploy them earlier and in amounts much larger than before. Tear gas is not a last resort as in the past, but a first line measure against protesters. In addition to CS, formulations of highly concentrated and potent pepper extracts (OC, Oleoresin Capsicum) are used, some in the form of shells and grenades propelled and ignited by pyrotechnic charges. The safety of these munitions has not been investigated, and it is unknown whether toxic combustion products are generated. Technological development of deployment systems has rapidly advanced in recent years, allowing deployment of larger amounts of tear gas munitions with precision and over longer distances, with potentially more injurious effects and risk of direct hits to protestors that can cause egregious injuries. At the same time, the CDC, State and local health departments and the police have failed to scrutinize the safety of the more potent munitions, their burn byproducts and the scaled up deployment. There

are currently no short or long-term studies conducted by any US institution investigating the health consequences of tear gas use at the current scale.

7. The safety assumptions for tear gas are mostly based on studies from the 1950s-70s on young and healthy police and military personnel that disregarded the diversity of protestors and affected residents that include children, elderly, persons with chronic respiratory or cardiovascular illnesses such as asthma, high blood pressure, irregular heartbeat and others. Studies using modern epidemiological and toxicological methods are lacking. The cited findings by the US military of widespread lung injury caused in training exercises using tear gas suggest that the risks associated with tear gas were underestimated in the past. The military therefore decided to significantly reduce exposure concentrations in training. Our data identifying pain nerves as a first target of tear gas agents point towards neurological effects such as chronic pain, loss of sensation and nerve inflammation. Studies by the EPA suggest that the pathway activated by tear gas can promote cardiac arrhythmia (irregular heartbeat), a big risk for persons in poor cardiovascular health. Children among the protestors are especially vulnerable to tear gas due to their low height since tear gas smoke and aerosols are heavier than air. Children also have a much smaller lung surface area, making them especially vulnerable to injuries. Pregnant women are also at high risk, and Physicians for Human Rights noted an increase in miscarriages after tear gas use during the Arab Spring protests.
8. As reported by the US military, a single exposure to CS tear gas increased the risk of presenting with a respiratory illness in the week after the exposure. Indications included influenza, pneumonia and bronchitis. These conditions are caused by viruses,

suggesting that tear gas increases the susceptibility to pathogens. Reactive chemicals such as CS are known to degrade the defenses of the lung that prevent viral and bacterial infections, by depleting antioxidant systems in the mucus, and degrading the capability of the lung to clear pathogens. I, and many expert colleagues, share the concern that tear gas agents may increase the risk of spreading COVID-19, by promoting coughing, sneezing, screaming and vomiting of persons who might be asymptomatic carriers. Moreover, tear gas may injure the respiratory system of protesters and make them more susceptible to infection by COVID-19. Many of the exposed have to remove protective masks due to contamination with CS, thereby exposing themselves to airborne Covid-19 and spreading the virus. Tear gas is used in police tactics such as kettling that confine protestors in smaller areas, preventing safety distancing and increasing the risk of infection. Therefore, I strongly support a moratorium of tear gas use while the Covid-19 pandemic is active in Portland and across the United States.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on June 8, 2020.



Dr. Sven-Eric Jordt